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| 09/476,615 | 12/31/1999 | MICHAEL S. CRONE | GE-W-192-CIP | 8072 |

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| EXAMINER | |
|---|---|
| BOYCE, ANDRE D | |

| ART UNIT | PAPER NUMBER |
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| 3623 | |

DATE MAILED: 10/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/476,615 | CRONE, MICHAEL S. | |
| | Examiner | Art Unit | |
| | Andre Boyce | 3623 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *24 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *2-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. This Final office action is in response to Applicant's amendment filed June 24, 2004. Claims 3, 6, 7, 13, and 14 have been amended. Claims 2-19 are pending.

2. The previously pending objections to claims 13 and 14 have been withdrawn

3. Applicant's arguments filed June 24, 2004 have been fully considered but they are not persuasive.

### *Claim Rejections - 35 USC § 101*

4. Claims 2-19 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The basis of this rejection is set forth in a two-prong test of:

(1) whether the invention is within the technological arts; and

(2) whether the invention produces a useful, concrete, and tangible result.

For a claimed invention to be statutory, the claimed invention must be within the technological arts. Mere ideas in the abstract (i.e., abstract idea, law of nature, natural phenomena) that do not apply, involve, use, or advance the technological arts fail to promote the "progress of science and the useful arts" (i.e., the physical sciences as opposed to social sciences, for example) and therefore are found to be non-statutory subject matter. For a process claim to pass muster, the recited

process must somehow apply, involve, use, or advance the technological arts. In the present case the independent claims 2, 8, 13, and 17-19 only recite abstract ideas.

The recited steps of establishing plural criteria for acceptance of a solution; classifying the scheduling problem; selecting the criteria for acceptance of a solution as a function of the classification of the scheduling problem; and emphasizing cost over resource exception for a predetermined initial period of the search phase, etc. does not involve, use, or advance the technological arts (e.g., processor, computer, electronic computing device), since the steps could be performed using pencil and paper.

Additionally, for a claimed invention to be statutory, the claimed invention must produce a useful, concrete, and tangible result. In the present case the claimed invention selects the criteria for acceptance of a solution, etc., thereby producing a useful, concrete, and tangible result, but not within the technological arts as explained above.

***Claim Rejections - 35 USC § 103***

5. Claims 2-7 and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matheson et al (USPN 5,623,413), in view of Fabre et al (USPN 6,405,186).

As per claim 2, Matheson et al disclose in a multiple move, simulated annealing method for resolving a scheduling problem associated with a plurality of orders for train resources, each order having a cost function and a scheduling window

associated therewith (see column 19, lines 4-8), and (i) determining the total trip time associated with the plurality of orders (determined by the movement planner, based upon the trajectory of the train, see columns 13, lines 14-16 and 38-46); and (ii) determining the total slack time associated with the plurality of orders (see column 26, lines 16-19, where the total time is calculated from slack percentage). Matheson et al does not disclose the improvement comprising the steps of: (a) establishing plural criteria for acceptance of a solution; (b) classifying the scheduling problem; and (c) selecting the criteria for acceptance of a solution as a function of the classification of the scheduling problem and (iii) determining the classification of the problem as a function of the total trip time and the slack time. Fabre et al discloses simulated annealing, where constructing an initial plan in order to improve the quality of the simulated annealing is done by classifying the request (i.e., problem) with certain criterion, and selecting the opportunities in the order determined by the previously established classification (Applicant's step (c), see column 6, lines 10-20). Fabre et al also discloses classifying requests in accordance with certain criterion (see column 6, lines 11-14). Further, Matheson et al discloses rule-based criteria that incorporate company policy, operating procedures, and experience factors, among others (see column 24, lines 4-6), wherein train operating procedures include total trip time and slack time, associated therein. Both Matheson and Fabre are concerned with optimizing a cost function via the simulated annealing technique, therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to include (a) establishing plural criteria for acceptance

of a solution; (b) classifying the scheduling problem; and (c) selecting the criteria for acceptance of a solution as a function of the classification of the scheduling problem, and (iii) determining the classification of the problem in accordance with certain criterion in Matheson, as seen in Fabre, as a way to improve the quality of the plan obtained at the end of the process or to improve the speed of convergence on the solution (see Fabre, column 6, lines 5-10), thus making the Matheson system more effective.

As per claims 3 and 7, Matheson et al does not explicitly disclose (a) selecting a predetermined percentage of total trip time to provide a threshold value; and (b) comparing slack time with the threshold value. Fabre et al discloses developing threshold parameters in accordance with the simulated annealing technique (see column 5, lines 46-55), while Matheson et al discloses rule-based criteria that incorporate company policy, operating procedures, and experience factors, among others (see column 24, lines 4-6), wherein train operating procedures include total trip time and slack time, associated therein. Both Matheson and Fabre are concerned with optimizing a cost function via the simulated annealing technique, therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to include selecting a predetermined percentage of total trip time to provide a threshold value; and comparing slack time with the threshold value in Matheson, as a way to improve the quality of the plan obtained at the end of the process or to improve the speed of convergence on the solution (see Fabre, column 6, lines 5-10), thus making the Matheson system more effective.

As per claims 4 and 5, Matheson et al does not explicitly disclose the selected percentage being less than about 100 percent and more than about 150 percent. Fabre et al disclose a selected percentage of 99 percent in order to determine the threshold condition value (column 4, lines 57-61). Further, any percentage between 0-100 percent is less than about 100 percent and there are infinite values more than about 150 percent. As a result, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include selecting a percentage being less than about 100 percent and more than about 150 percent in Matheson et al thereby providing further means for classifying the scheduling problem, thus ensuring that the algorithm stabilizes after a certain number of iterations (Fabre, column 4, lines 63-64).

Claim 6 is rejected based upon the rejection of claim 2, as seen above, as containing the same limitations therein. Further, Matheson et al disclose (a) determining the total trip time associated with the plurality of orders (determined by the movement planner, based upon the trajectory of the train, see columns 13, lines 14-16 and 38-46); and (b) determining the resource exception associated with the plurality of orders (see column 21, lines 10-12). Matheson et al do not explicitly discloses (c) determining the classification of the problem as a function of the total trip time and the resource exception. Fabre et al discloses classifying requests in accordance with certain criterion (see column 6, lines 11-14). Further, Matheson et al discloses rule-based criteria that incorporate company policy, operating procedures, and experience factors, among others (see column 24, lines 4-6),

wherein train operating procedures include resource exception, total trip time and slack time, associated therein. Both Matheson and Fabre are concerned with optimizing a cost function via the simulated annealing technique, therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to include determining the classification of the problem in accordance with certain criterion in Matheson, as seen in Fabre, as a way to improve the quality of the plan obtained at the end of the process or to improve the speed of convergence on the solution (see Fabre, column 6, lines 5-10), thus making the Matheson system more effective.

As per claims 13, 15, and 16, Matheson et al disclose a method for resolving a scheduling problem associated with a plurality of orders for train resources by evaluating available moves in a simulated annealing process, each move resulting in a change in the resource exception associated with the problem and a change in cost associated with the move (see column 19, lines 4-8), comprising the steps of: (b) making a random move (see column 19, lines 14-15), (c) weighting the resource exception and cost factors associated with the random move (see column 21, lines 10-13); (d) evaluating the resource exception and the cost of the solution against a predetermined criteria (energy function); and g) accepting or rejecting the move based on the evaluation (see column 19, line 17-20). Matheson et al does not disclose (a) classifying the scheduling problem, a scaling parameter related to the classification of the problem, and the predetermined criteria is the classification of the problem. Fabre et al discloses classifying requests in accordance with certain

criterion (see column 6, lines 11-14), and selecting the opportunities in the order determined by the classification (scaling parameter). Both Matheson and Fabre are concerned with optimizing a cost function via the simulated annealing technique, therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to include determining the classification of the problem in accordance with certain criterion in Matheson, as seen in Fabre, as a way to improve the quality of the plan obtained at the end of the process or to improve the speed of convergence on the solution (see Fabre, column 6, lines 5-10), thus making the Matheson system more effective.

As per claim 14, Matheson et al does not disclose the steps of: (a) determining a normalizing component of the scaling parameter as a function of the change in resource exception and cost from previous moves; (b) determining a target resource exception as a function of the number of previous moves; and (c) determining a biasing component of the scaling parameter as a function of a comparison of the resource exception of the current move to the target resource exception. Fabre et al discloses developing threshold parameters in accordance with the simulated annealing technique (see column 5, lines 46-55) and the threshold percentage ensuring that the algorithm stabilizes after a certain number of moves (column 4, lines 63-64). Further, Matheson et al does disclose moves to satisfy the constraints and to obtain a lowest cost solution (see column 19, lines 4-8). As a result, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include determining a normalizing component of the scaling parameter

as a function of the change in resource exception and cost from previous moves; (b) determining a target resource exception as a function of the number of previous moves; and (c) determining a biasing component of the scaling parameter as a function of a comparison of the resource exception of the current move to the target resource exception in Matheson et al, as a way to improve the quality of the plan obtained at the end of the process or to improve the speed of convergence on the solution (see Fabre, column 6, lines 5-10), thus making the Matheson system more effective.

6. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matheson et al (USPN 5,623,413), in view of LeSaint et al (WO 9822897).

As per claim 8, Matheson et al disclose in a multiple move, simulated annealing method for resolving a scheduling problem associated with a plurality of orders for train resources having an initial resource exception and a cost associated therewith by evaluating the resource exception and cost associated with each move during a search phase (see column 19, lines 4-8). Matheson et al does not explicitly disclose the step of emphasizing cost over resource exception for a predetermined initial period of the search phase. LeSaint et al disclose an initial schedule in a simulated annealing process that emphasizes cost over task allocation (e.g., resource exception, see page 21, ¶ 8-9). Both Matheson and LeSaint are concerned with effective simulated annealing techniques, therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to include

emphasizing cost over resource exception for a predetermined initial period of the search phase in Matheson, as seen in LeSaint, thereby giving more emphasis to the element deemed more important in the particular annealing method, thus making the method more flexible.

As per claim 9, Matheson et al disclose the initial period is a function of one of (1) a predetermined number of moves (see column 19, lines 37-41 where determining whether to use certain move operators, determines the number of moves) and (2) the value of the resource exception (see column 21, lines 10-13).

7. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matheson et al (USPN 5,623,413), in view of LeSaint et al (WO 9822897) as applied to claims 8-9 above, in further view of Cohn et al (USPN 5,745,735).

As per claims 10-11, Matheson et al does not explicitly disclose the initial period limited to about one hundred moves and limited to the time at which the value of the resource exception becomes less than about one percent. Cohn et al disclose the number of moves based upon the initial value of the localized temperature (see column 4, lines 37-47), which could be about one hundred. Cohn et al also discloses increasing the temperature until a predetermined percentage of moves are accepted (see column 4, lines 49-52). Both Matheson et al and Cohn et al relate to optimization by simulated annealing, therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to include the initial period limited to about one hundred moves and limited to the time at which the value

of the resource exception becomes less than about one percent, in Matheson et al, as seen in Cohn et al, thus focusing the simulated annealing on more directed manner (see Matheson et al, column 19, lines 34-36).

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matheson et al (USPN 5,623,413), in view of LeSaint et al (WO 9822897) as applied to claims 8-9 above, in further view of Fabre et al (USPN 6,405,186).

As per claim 12, Matheson et al disclose the step of emphasizing cost includes the steps of: (a) classifying the scheduling problem (classification is based upon figure of merit, see column 6, lines 36-42); b) determining a maximum number of moves as a function of the classification of the scheduling problem (based on starting temperature and number of reduction steps, see column 19, lines 20-23); and (c) determining the initial resource exception associated with the scheduling problem (see column 21, lines 10-13). Matheson et al does not disclose (d) setting a threshold value as a predetermined percentage of the initial resource exception; and (e) emphasizing cost over resource exception until the first to occur of: (i) a reduction of the resource exception below the threshold value, and (ii) the maximum number of moves is reached. Fabre et al discloses developing threshold parameters in accordance with the simulated annealing technique (see column 5, lines 46-55) and the threshold percentage ensuring that the algorithm stabilizes after a certain number of moves. Further, Matheson et al does disclose moves to satisfy the constraints and to obtain a lowest cost solution (see column 19, lines 4-8). As a

result, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include setting a threshold value as a predetermined percentage of the initial resource exception; and (e) emphasizing cost over resource exception until the first to occur of: (i) a reduction of the resource exception below the threshold value, and (ii) the maximum number of moves is reached. in Matheson, as a way to improve the quality of the plan obtained at the end of the process or to improve the speed of convergence on the solution (see Fabre, column 6, lines 5-10), thus making the Matheson system more effective.

9. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matheson et al (USPN 5,623,413).

As per claim 17, Matheson et al disclose in a multiple move, simulated annealing method of scheduling train resources by considering the resource exception value and the cost associated with each of the moves (see column 19, lines 4-8). Matheson et al does not explicitly disclose the improvement comprising the step of limiting the total resource exception time to approximately one percent of the total unopposed trip time. However, Matheson et al disclose the resource exception being weighted as a function of other factors (see column 21, lines 10-13). Further, Matheson discloses the weighting constraints able to be specified by the user (column 23, lines 36-40), which could include limiting the total resource exception. As a result it would have been obvious to one having ordinary skill in the art at the time the invention was made to include limiting the total resource exception time to

approximately one percent of the total unopposed trip time, in Matheson et, as a weighted constraint based upon trip time, thus allowing the energy function to focus on critical resources.

As per claim 18, Matheson et al disclose in a multiple move, simulated annealing method of solving a problem in the scheduling of train resources (see column 19, lines 4-8). Matheson et al does not explicitly disclose reducing the level of acceptance of a solution in the evaluations of the results of early moves in order to preserve options for subsequent moves. However, Matheson discloses optimization allowed to take some bad moves early (see column 19, lines 15-18). Further, Matheson discloses re-initializing the search parameters by reducing the number of attempts with no higher energy steps, thereby reducing the level of acceptance of a solution (column 20, lines 40-47), therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to include reducing the level of acceptance of a solution in the evaluations of the results of early moves in order to preserve options for subsequent moves in Matheson, thereby focusing the attention of the annealing method in more critical areas in later stages of the search process (see column 19, lines 24-34), thus making the method more effective.

As per claim 19, Matheson et al does not explicitly disclose by evaluating the resource exception and cost associated with each move during a search phase, the steps of: (a) providing a target resource exception; and (b) weighting evaluations of the effects of subsequent moves on the resource exception and cost as a function of

the departure of resource exception from the target. However, providing a target would be a logical progression, since Matheson et al disclose the resource exception being weighted as a function of other factors (see column 21, lines 10-13). Further, Matheson discloses the weighting constraints able to be specified by the user (column 23, lines 36-40), which could include a target resource exception. In addition, weighting evaluations of subsequent moves is old and well-known in simulated annealing. As a result, it would have been obvious to one having ordinary skill in the art at the time the invention was made to include (a) providing a target resource exception; and (b) weighting evaluations of the effects of subsequent moves on the resource exception and cost as a function of the departure of resource exception from the target, in Matheson et al thereby further focusing the optimization, and allowing the energy function to focus on critical resources.

***Response to Arguments***

10. With respect to the rejections under 35 USC § 101, the Examiner respectfully submits that the phrase "technological arts" is synonymous with the phrase "useful arts" as it appears in Article I, Section 8 of the Constitution. *In re Waldbauem*, 173 USPQ 430 (CCPA 1972). And for a claim to be statutory it must be in the technological arts. *In re Musgrave*, 167 USPQ 280 (CCPA 1970) and *In re Johnston*, 183 USPQ 172 (CCPA 1974). The technological arts inquiry must focus on whether the claim subject matter is statutory. *In re Toma*, 197 USPQ 852 (CCPA 1978). *Toma* held "that the method of enabling a computer to translate natural

languages is in the technological arts, i.e., it is a method of operating a machine." Further, the invention in the body of the claim must recite technology. If the invention in the body of the claim is not tied to technological art, environment, or machine, the claim is not statutory. Ex parte Bowman, 61 USPQ2d 1665, 1671 (BD. Pat. App. & Inter. 2001) (Unpublished). Also note MPEP 2106 IV 2(b).

With respect to claims 2-7, Applicant argues that the relationships in the present application were not recognized as result-effective variables in the prior art and that Applicant's disclosure of the result-effective variables and optimum values thereof cannot be obvious over the cited art. First, the Examiner respectfully submits that he is unable to locate any evidence, in Applicant's specification or drawings, as to Applicant's alleged assertion that an improved schedule results from Applicant's relationship between the parameters, thereby making them result-effective. Further, Applicant's claim limitations, including "the selected percentage is less than about 100 percent" (i.e., anything < 100), and "the selected percentage is more than about 150 percent" (i.e., anything >150), which determine the relationship between total trip time and total slack time and the optimum values thereof, seem to be completely within what one of ordinary skill in the art would consider obvious.

With respect to claims 2 and 6, the Examiner respectfully submits that he is unable to locate any evidence where Applicant discloses that the relationships are determined to be result effective, other than Applicant's alleged assertions. Further, Matheson et al disclose the resource scheduler 330 globally optimizing scheduling of trains based upon train movement and resources, which inherently includes

weighing combinations of resource exception, slack and trip time. As a result, Matheson et al in view of Fabre, as seen above, would indeed render Applicant's claims 2-7 and 13-16 obvious to one of ordinary skill in the art. In addition, Fabre et al disclose classifying requests in accordance with certain criterion, which is indeed relevant to Applicant's claim language, since Fabre et al is concerned with optimizing a cost function via the simulated annealing technique.

With respect to claims 13-16, Applicant argues that Fabre et al does not disclose weighting using a scaling parameter. The Examiner respectfully disagrees and submits that Fabre discloses constructing an initial plan by taking the requests in order and giving each request as many opportunities in the initial plan as are required to saturate the request, wherein the saturation level is equivalent to a weighting level (i.e., classification of the problem determines the saturation level).

With respect to claim 18, Applicant argues that Matheson teaches away from reducing the level of acceptance of a solution in early moves in order to preserve options in later moves. The Examiner submits that Applicant's specification contains the identical passage, as seen on page 44, rendering Applicant's argument moot.

With respect to claim 19, the Examiner submits that Matheson et al disclose the resource exception being weighted as a function of other factors, wherein the weighting constraints able to be specified by the user, which inherently could include a target resource exception. In addition, weighting evaluations of subsequent moves is old and well-known in simulated annealing.

With respect to claim 8, Applicant argues that LeSaint does not disclose emphasizing cost over resource exception for a predetermined initial period of the search phase. The Examiner disagrees and submits that LeSaint (USPN 6578005) discloses the simulated annealer able to stop at a predetermined time, based upon the value of the objective function, wherein the optimizing subsystem is able to emphasize one portion of the objective function over another (column 23, lines 56-66).

***Conclusion***

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andre Boyce whose telephone number is (703) 305-1867. The examiner can normally be reached on 9:30-6pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tariq Hafiz can be reached on (703) 305-9643. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

adb

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